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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to organic electroluminescence devices.

[0002]

[Description of the Prior Art]Conventionally, although used as panel type light sources, such as a back light, for example, in order to make this light emitting device drive, the high tension of exchange is required for inorganic electroluminescence devices. These days came and the organic electroluminescence devices (organic electroluminescence element: organic EL device) which used organic materials for the luminescent material were developed. Appl. Phys. Lett., and [51, 913] (1987). Organic electroluminescence devices have the structure pinched between the anode and the negative pole in the thin film containing a fluorescence organic compound, and inject an electron and an electron hole (hole) into this thin film, It is an element which emits light using the light emitted when an exciton (exciton) is made to generate and this exciton is deactivated by making it recombine. organic electroluminescence devices -- severalV - several 10 -- it is a low voltage of about V direct current, and luminescence of various colors (for example, red, blue, green) is possible by being able to emit light and choosing the kind of fluorescence organic compound.

[0003]The application to various light emitting devices, a display device, etc. is expected from the organic electroluminescence devices which have such a feature. However, generally organic electroluminescence devices have difficulties, like it is scarce in stability and endurance. Light emitting luminance is low and is not enough practically. As a hole-injection transported material, it is a 4,4'-screw. [N-phenyl-N-(3"-methylphenyl) amino] Using biphenyl is proposed. [Jpn. J. Appl.Phys., 27, L269 (1988)] .However, these organic electroluminescence devices also have difficulties, like it is scarce in stability and endurance.

[0004]As how to raise light emitting luminance, the organic electroluminescence devices which

used tris(8-quinolate) aluminum as a luminous layer, and used the host compound, the coumarin derivative, and the pyran derivative as a guest compound (dopant), for example are proposed. J.Appl. Phys., and [65, 3610] (1989) .Bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum as a luminous layer A host compound, Organic electroluminescence devices using the acridone derivative (for example, N-methyl-2-methoxy acridone) as a guest compound are proposed (JP,8-67873,A). However, these light emitting devices are also hard to be referred to as having sufficient light emitting luminance. Now, organic electroluminescence devices improved further are desired.

[0005]

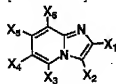
[Problem(s) to be Solved by the Invention]The technical problem of this invention is providing the organic electroluminescence devices by which stability, endurance, and light emitting luminance were improved.

[0006]

[Means for Solving the Problem]This invention persons came to complete this invention, as a result of examining organic electroluminescence devices wholeheartedly. Namely, a layer as for which this invention contains at least one sort of azaindizine derivatives in inter-electrode [ of \*\* couple ], Organic electroluminescence devices pinched further at least and a layer containing \*\* azaindizine derivative, Organic electroluminescence devices given [ aforementioned ] in \*\* which is a hole-injection transporting bed, and a layer containing \*\* azaindizine derivative, Organic electroluminescence devices given [ aforementioned ] in \*\* which is a luminous layer, and a layer containing \*\* azaindizine derivative, a polynuclear aromatic compound, a luminescent organometallic complex, or doria -- organic electroluminescence devices given in either the aforementioned \*\* containing at least one sort of reel amine derivatives - \*\*. \*\* The aforementioned \*\* which has a luminous layer further in inter-electrode [ of a couple ], or organic electroluminescence devices given in \*\*, \*\* Organic electroluminescence devices given in either the aforementioned \*\* which has an electron injection transporting bed further in inter-electrode [ of a couple ] - \*\*, \*\* An azaindizine derivative is related with either the aforementioned \*\* which is a compound expressed with a general formula (1-A) (\*\* 3) or a general formula (2-A) (\*\* 4) - \*\*, without organic electroluminescence devices of a statement.

[0007]

[Formula 3]



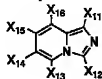
(1-A)

the inside of a formula,  $X_1 - X_6$  -- respectively -- independent -- a hydrogen atom. A halogen

atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, The aralkyloxy group which is not replaced [ the aryl group which is not replaced / the aralkyl group which is not replaced / substitution or /, substitution, or /, substitution or ], Express the aryloxy group which is not replaced [ substitution or ] and further Or  $X_1$  and  $X_2$ , With the carbon atom which combined mutually the adjoining basis which is chosen from  $X_3$ ,  $X_4$  and  $X_4$ ,  $X_5$  and  $X_5$ , and  $X_6$ , and has been replaced. Carbocyclic aromatic ring formation of the carbocyclic aliphatic series ring which is not replaced [ substitution or ], substitution, or un-replacing may be carried out.

[0008]

[Formula 4]



(2-A)

the inside of a formula,  $X_{11}$  -  $X_{16}$  -- respectively -- independent -- a hydrogen atom. A

halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, An aralkyloxy group which is not replaced [ an aryl group which is not replaced / an aralkyl group which is not replaced / substitution or /, substitution, or /, substitution or ], Or express an aryloxy group which is not replaced [ substitution or ] and an adjoining basis which is chosen from  $X_{13}$ ,  $X_{14}$  and  $X_{14}$ ,  $X_{15}$  and  $X_{15}$ , and  $X_{16}$  is combined further mutually, With a replaced carbon atom, carbocyclic aromatic ring formation of a carbocyclic aliphatic series ring which is not replaced [ substitution or ], substitution, or un-replacing may be carried out.

[0009]

[Embodiment of the Invention] Hereafter, this invention is explained in detail. The organic electroluminescence devices of this invention pinch further at least the layer which contains at least one sort of azaindolizine derivatives in inter-electrode [ of a couple ]. The azaindolizine derivative (it is hereafter written as the compound A concerning this invention) concerning this invention, One carbon atom in the indolizine skeleton expressed with a formula (A) and the (\*\* 5) is the compound which replaced the nitrogen atom, and preferably, Are 2-azaindolizine skeleton expressed with 1-azaindolizine expressed with a formula (1) and the (\*\* 5) or a formula (2), and the (\*\* 5) a compound which it has, and in the skeleton of this compound. Various substituents may replace and it is a compound expressed with a general formula (1-A) (\*\* 6) or a general formula (2-A) (\*\* 7) preferably. The compound which has 1-azaindolizine skeleton expressed with a formula (1) is imidazo [1,2-a]. It is a compound called a pyridine

derivative. The compound which has 2-azaindolizine skeleton expressed with a formula (2) is imidazo [1,5-a]. It is a compound called a pyridine derivative.

[0010]

[Formula 5]



(A)



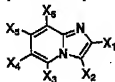
(1)



(2)

[0011]

[Formula 6]

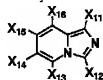


(1-A)

the inside of a formula,  $X_1 - X_6$  -- respectively -- independent -- a hydrogen atom. A halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, The aralkyloxy group which is not replaced [ the aryl group which is not replaced / the aralkyl group which is not replaced / substitution or /, substitution, or /, substitution or ], Express the aryloxy group which is not replaced [ substitution or ] and further Or  $X_1$  and  $X_2$ . With the carbon atom which combined mutually the adjoining basis which is chosen from  $X_3$ ,  $X_4$  and  $X_4$ ,  $X_5$  and  $X_5$ , and  $X_6$ , and has been replaced. Carbocyclic aromatic ring formation of the carbocyclic aliphatic series ring which is not replaced [ substitution or ], substitution, or un-replacing may be carried out.

[0012]

[Formula 7]



(2-A)

the inside of a formula,  $X_{11} - X_{16}$  -- respectively -- independent -- a hydrogen atom. A halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching, or an annular alkoxy group, The aralkyloxy group which is not replaced [ the aryl

group which is not replaced / the aralkyl group which is not replaced / substitution or /, substitution, or /, substitution or ], Or express the aryloxy group which is not replaced [ substitution or ] and the adjoining basis which is chosen from  $X_{13}$ ,  $X_{14}$  and  $X_{14}$ ,  $X_{15}$  and  $X_{15}$ , and  $X_{16}$  is combined further mutually, With the replaced carbon atom, carbocyclic aromatic ring formation of the carbocyclic aliphatic series ring which is not replaced [ substitution or ], substitution, or un-replacing may be carried out.

[0013]In the compound expressed with a general formula (1-A) and a general formula (2-A),  $X_1 - X_6$  and  $X_{11} - X_{16}$  independently, respectively, The aryloxy group which is not replaced [ the aralkyloxy group which is not replaced / the aryl group which is not replaced / the aralkyl group which is not replaced / a hydrogen atom, a halogen atom, a straight chain, branching or an annular alkyl group, a straight chain, branching or an annular alkoxy group, substitution or /, substitution, or /, substitution, or /, substitution, or ] is expressed. In the compound expressed with a general formula (1-A),  $X_1$  and  $X_2$ , In the adjoining basis which is chosen from  $X_3$ ,  $X_4$  and  $X_4$ ,  $X_5$  and  $X_5$ , and  $X_6$ , and the compound expressed with a general formula (2-A), The adjoining basis which is chosen from  $X_{13}$ ,  $X_{14}$  and  $X_{14}$ ,  $X_{15}$  and  $X_{15}$ , and  $X_{16}$ , Carbocyclic aromatic ring formation of the carbocyclic aliphatic series ring which is not replaced [ substitution or ], substitution, or un-replacing may be carried out with the carbon atom which was combined mutually and has been replaced. An aryl group expresses heterocyclic aromatic groups, such as carbocyclic aromatic groups, for example, a furil group, such as a phenyl group and a naphthyl group, a thienyl group, and a pyridyl group, for example.

[0014]In a compound expressed with a general formula (1-A) and a general formula (2-A),  $X_1 - X_6$  and  $X_{11} - X_{16}$ , desirable -- a hydrogen atom and a halogen atom (for example, a fluorine atom and a chlorine atom.) A bromine atom, a straight chain of the carbon numbers 1-16, branching, or an annular alkyl group. for example, a methyl group, an ethyl group, n-propyl group, and an isopropyl group. n-butyl group, an isobutyl group, a sec - butyl group, a tert-butyl group, n-pentyl group, an isopentyl group, a neopentyl group, a tert-pentyl group, A cyclopentyl group, n-hexyl group, 1-methylpentyl group, a 4-methyl-2-pentyl group, A 3,3-dimethylbutyl group, 2-ethylbutyl group, a cyclohexyl group, n-heptyl group, 1-methylhexyl group, a cyclohexylmethyl group, A cycloheptyl group, n-octyl group, a tert-octyl group, 1-methyl heptyl group, A 2-ethylhexyl group, 2-propylpentyl group, a cyclooctyl group, n-nonyl group, a 2,2-dimethyl heptyl group, a 2,6-dimethyl- 4-heptyl group, a 3,5,5-trimethylhexyl group, n-decyl group, n-undecyl group, 1-methyldecyl group, n-dodecyl, n-tridecyl group, 1-hexyl heptyl group, n-tetradecyl group, an n-pentadecyl group, n-hexadecyl group, etc., [0015] a straight chain of the carbon numbers 1-16, branching, or an annular alkoxy group (for example, a methoxy group.) An ethoxy basis, n-propoxy group, an isopropoxy group, n-butoxy

group, An isobutoxy group, a sec - butoxy group, an n-pentyloxy group, a neopentyl oxy group, A cyclopenthyloxy group, an n-hexyloxy group, a 3,3-dimethyl butyloxy group, 2-ethyl butyloxy group, a cyclohexyloxy group, n-heptyloxy group, n-octyloxy group, 2-ethylhexyloxy group, n-nonyloxy group, An n-decyloxy group, n-dodecyloxy group, n-tetradecyloxy group, Aralkyl groups which are not replaced [ substitution of the carbon numbers 5-16, or ], such as n-hexadecyloxy group. for example, benzyl, phenethyl group, alpha-methylbenzyl group, alpha, and alpha-dimethylbenzyl group. 1-naphthyl methyl group, 2-naphthyl methyl group, a furfuryl group, 2-methylbenzyl group, 3-methylbenzyl group, 4-methylbenzyl group, 3-ethylbenzyl, 4-ethylbenzyl, 4-isopropylbenzyl, a 4-tert-butylbenzyl group, 4-n-hexylbenzyl, 4-n-nonylbenzyl, a 2,4-dimethylbenzyl group, A 3,4-dimethylbenzyl group, 3-methoxybenzyl group, 4-methoxybenzyl group, 4-ethoxybenzyl group, 4-n-butoxybenzyl, 4-n-hexyloxy benzyl, 4-n-octyloxy benzyl, 3, 4-dimethoxybenzyl group, 3-fluorobenzyl, 4-fluorobenzyl, 2-chlorobenzyl, 3-chlorobenzyl, 4-chlorobenzyl, 2,4-dichlorobenzyl, 3,4-dichlorobenzyl, a diphenylmethyl group, etc., [0016]an aryl group (for example, a phenyl group.) which is not replaced [ substitution of the carbon numbers 4-16, or ] 2-methylphenyl group, 3-methylphenyl group, 4-methylphenyl group, 3-ethyl phenyl group, 4-ethyl phenyl group, a 4-n-propyl phenyl group, 4-isopropyl phenyl group, a 4-n-buthylphenyl group, a 4-tert-buthylphenyl group, A 4-n-pentyl phenyl group, 4-isopentyl phenyl group, a 4-tert-pentyl phenyl group, A 4-n-hexyl phenyl group, 4-cyclohexyl phenyl group, a 4-n-octyl phenyl group, A 4-n-decyl phenyl group, 2, 3-dimethylphenyl group, 2, 4-dimethylphenyl group, 2, 5-dimethylphenyl group, 2, 6-dimethylphenyl group, 3, 4-dimethylphenyl group, 3, 5-dimethylphenyl group, 3 and 4, 5-trimethyl phenyl group, 2, 3, 5, a 6-tetramethyl phenyl group, 5-indanyl group, 1, 2 and 3, a 4-tetrahydro 5-naphthyl group, A 1,2,3,4-tetrahydro 6-naphthyl group, 2-methoxyphenyl group, 3-methoxyphenyl group, 4-methoxyphenyl group, 3-ethoxy phenyl group, 4-ethoxy phenyl group, a 4-n-propoxy phenyl group, 4-isopropoxy phenyl group, a 4-n-butoxy phenyl group, 4-isobutoxy phenyl group, A 4-n-pentyloxy phenyl group, a 4-n-hexyloxy phenyl group, 4-cyclohexyloxy phenyl group, a 4-n-heptyloxy phenyl group, a 4-n-octyloxy phenyl group, a 4-n-nonyloxy phenyl group, a 4-n-decyloxy phenyl group, [0017]A 2,3-dimethoxy phenyl group, a 2,4-dimethoxy phenyl group, a 2,5-dimethoxy phenyl group, A 3,4-dimethoxy phenyl group, a 3,5-dimethoxy phenyl group, a 3,5-diethoxy phenyl group, A 2-methoxy-4-methylphenyl group, a 2-methoxy-5-methylphenyl group, A 2-methyl-4-methoxyphenyl group, a 3-methyl-4-methoxyphenyl group, A 2-methyl-4-ethoxy phenyl group, a 3-methoxy-4-methylphenyl group, A 3-methyl-5-methoxyphenyl group, 2-fluorophenyl group, 3-fluorophenyl group, 4-fluorophenyl group, 2-chlorophenyl group, a 3-chlorophenyl group, 4-chlorophenyl group, 4-bromo phenyl group, 4-trifluoro methylphenyl group, A 2,4-difluoro phenyl group, 2, 4-dichlorophenyl group, 3, 4-dichlorophenyl group, A 3,5-dichlorophenyl group, a 3-methyl-5-fluorophenyl group, A 2-methyl-4-chlorophenyl group, a 2-chloro-4-methylphenyl group, a 3-chloro-4-methylphenyl

group, a 2-chloro-4-methoxyphenyl group, a 3-methoxy-4-fluorophenyl group, a 3-methoxy-4-chlorophenyl group, A 3-fluoro-4-methoxyphenyl group, 4-phenyl phenyl group, 3-phenyl phenyl group, 4-(4'-methylphenyl) phenyl group, 4-(4'-methoxyphenyl) phenyl group, 1-naphthyl group, 2-naphthyl group, A 4-methyl-1-naphthyl group, a 4-ethoxy-1-naphthyl group, a 6-n-butyl-2-naphthyl group, A 6-methoxy-2-naphthyl group, a 7-ethoxy-2-naphthyl group, 2-furyl group, 2-thienyl group, 3-thienyl group, 2-pyridyl group, 3-pyridyl group, 4-pyridyl group, etc., [0018]An aralkyloxy group which is not replaced [ substitution of the carbon numbers 5-16, or ]. for example, a benzyloxy group, a phenethyloxy group, and alpha-methylbenzyl oxy group. alpha and alpha-dimethyl benzyloxy group, 1-naphthylmethyloxy group, 2-naphthylmethyloxy group, a furfuryl oxy group, 2-methylbenzyl oxy group, 3-methylbenzyl oxy group, 4-methylbenzyl oxy group, 3-ethyl benzyloxy group, 4-ethyl benzyloxy group, 4-isopropyl benzyloxy group, A 4-tert-butylbenzyl oxy group, a 4-n-hexyl benzyloxy group, A 4-n-nonyl benzyloxy group, a 2,4-dimethyl benzyloxy group, A 3,4-dimethyl benzyloxy group, 3-methoxybenzyloxy group, 4-methoxybenzyloxy group, 4-ethoxy benzyloxy group, a 4-n-butoxy benzyloxy group, A 4-n-hexyloxy benzyloxy group, a 4-n-octyloxy benzyloxy group, A 3,4-dimethoxy benzyloxy group, 3-fluoro benzyloxy group, 4-fluoro benzyloxy group, 2-chloro benzyloxy group, 3-chloro benzyloxy group, 4-chloro benzyloxy group, A 2,4-dichloro benzyloxy group, a 3,4-dichloro benzyloxy group, a diphenylmethyloxy group, etc., [0019]Or an aryloxy group which is not replaced [ substitution of the carbon numbers 4-16, or ]. for example, a phenyloxy group, 2-methylphenyloxy group, and 3-methylphenyloxy group. 4-methylphenyloxy group, 4-ethylphenyloxy group, a 4-n-propyl phenyloxy group, 4-isopropyl phenyloxy group, a 4-n-buthylphenyl oxy group, A 4-tert-buthylphenyl oxy group, 4-isopentyl phenyloxy group, A 4-tert-pentyl phenyloxy group, a 4-n-hexyl phenyloxy group, 4-cyclohexyl phenyloxy group, a 4-n-octyl phenyloxy group, A 4-n-decyl phenyloxy group, a 2,3-dimethyl phenyloxy group, A 2,4-dimethyl phenyloxy group, a 2,5-dimethyl phenyloxy group, A 3,4-dimethyl phenyloxy group, 5-indanyl oxy group, 1, 2 and 3, a 4-tetrahydro 5-naphthyloxy group, A 1,2,3,4-tetrahydro 6-naphthyloxy group, 2-methoxyphenyloxy group, 3-methoxyphenyloxy group, 4-methoxyphenyloxy group, 3-ethoxyphenyloxy group, 4-ethoxyphenyloxy group, a 4-n-propoxy phenyloxy group, 4-isopropoxy phenyloxy group, a 4-n-butoxy phenyloxy group, A 4-n-pentyloxy phenyloxy group, a 4-n-hexyloxy phenyloxy group, 4-cyclohexyloxy phenyloxy group, a 4-n-heptyloxy phenyloxy group, A 4-n-octyloxy phenyloxy group, a 4-n-decyloxy phenyloxy group, A 2,3-dimethoxy phenyloxy group, a 2,5-dimethoxy phenyloxy group, A 3,4-dimethoxy phenyloxy group, a 2-methoxy-5-methylphenyloxy group, A 3-methyl-4-methoxyphenyloxy group, 2-fluoro phenyloxy group, 3-fluoro phenyloxy group, 4-fluoro phenyloxy group, 2-chlorophenyl oxy group, A 3-chlorophenyl oxy group, 4-chlorophenyl oxy group, 4-bromo phenyloxy group, 4-trifluoromethyl phenyloxy group, a 3,4-dichloro phenyloxy group, A 2-methyl-4-chlorophenyl oxy group, a 2-chloro-4-methylphenyloxy group, a

3-chloro-4-methylphenoxy group, a 2-chloro-4-methoxyphenoxy group, 4-phenyl phenoxy group, 3-phenyl phenoxy group, 4-(4'-methylphenyl) phenoxy group, 4-(4'-methoxyphenyl) phenoxy group, A 1-naphthoxy group, a 2-naphthoxy group, a 4-ethoxy-1-naphthoxy group, They are a 6-methoxy-2-naphthoxy group, a 7-ethoxy-2-naphthoxy group, a 2-furyloxy group, 2-thienyl oxy group, 3-thienyl oxy group, 2-pyridyloxy group, 3-pyridyloxy group, 4-pyridyloxy group, etc.

[0020]More preferably A hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-10, An alkoxy group of the carbon numbers 1-10, an aralkyl group of the carbon numbers 7-10, an aryl group of the carbon numbers 6-10, Are an aralkyloxy group of the carbon numbers 7-10, or an aryloxy group of the carbon numbers 6-10, and still more preferably, A hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-6, an alkoxy group of the carbon numbers 1-6, Are an aralkyl group of the carbon numbers 7-10, an aryl group of the carbon numbers 6-10, an aralkyloxy group of the carbon numbers 7-10, or an aryloxy group of the carbon numbers 6-10, and preferably especially, They are a hydrogen atom, a fluorine atom, a chlorine atom, an alkyl group of the carbon numbers 1-4, an alkoxy group of the carbon numbers 1-4, an aralkyl group of the carbon numbers 7-10, an aryl group of the carbon numbers 6-10, an aralkyloxy group of the carbon numbers 7-10, or an aryloxy group of the carbon numbers 6-10.

[0021]In a compound furthermore expressed with a general formula (1-A),  $X_1$  and  $X_2$ , In an adjoining basis which is chosen from  $X_3$ ,  $X_4$  and  $X_4$ ,  $X_5$  and  $X_5$ , and  $X_6$ , and a compound expressed with a general formula (2-A), An adjoining basis which is chosen from  $X_{13}$ ,  $X_{14}$  and  $X_{14}$ ,  $X_{15}$  and  $X_{15}$ , and  $X_{16}$ , With a carbon atom which was combined mutually and has been replaced, may be carrying out carbocyclic aromatic ring formation of a carbocyclic aliphatic series ring which is not replaced [ substitution or ], substitution, or un-replacing, and preferably,  $X_1$ ,  $X_2$  and  $X_3$ ,  $X_4$  and  $X_4$ , and  $X_5$ . With a carbon atom which combined mutually an adjoining basis which is chosen from  $X_5$ ,  $X_6$  and  $X_{13}$ ,  $X_{14}$  and  $X_{14}$ ,  $X_{15}$  and  $X_{15}$ , and  $X_{16}$ , and has been replaced. A carbocyclic aromatic ring which is not replaced [ substitution of a carbocyclic aliphatic series ring which is not replaced / substitution of the total carbon numbers 5-10 or / or the total carbon numbers 6-10 or ] may be formed.

[0022]As an example of a carbocyclic aliphatic series ring or a carbocyclic aromatic ring, For example, a cyclopentene ring, a cyclohexene ring, a cycloheptene ring, a cyclooctane ring, a cyclodecene ring, the benzene ring, a naphthalene ring, etc. can be mentioned, and they are a cyclohexene ring and the benzene ring more preferably. A carbocyclic aliphatic series ring and a carbocyclic aromatic ring may have a substituent, for example, a substituent quoted by  $X_1$  -



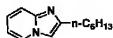
$X_6, X_{11} - X_{16}$  -- single substitution -- or it may be many replaced and they are an unreplaced carbocyclic aliphatic series ring or an unreplaced carbocyclic aromatic ring more preferably. As an example of compound A concerning this invention, although the following compounds can be mentioned, this invention is not limited to these, for example.

[0023]

[Formula 8]

例示化合物番号

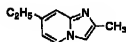
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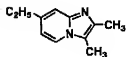
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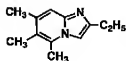
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A-4



A-5



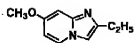
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[Formula 9]

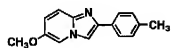
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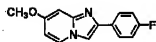
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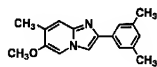
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A-9



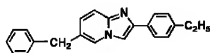
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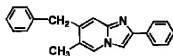
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[Formula 10]

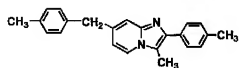
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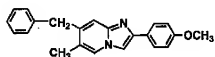
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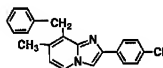
A-13



A-14



A-15



[0026]

[Formula 11]

A-16



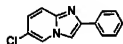
A-17



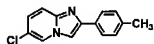
A-18



A-19



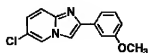
A-20



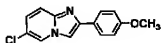
[0027]

[Formula 12]

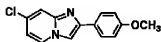
A-21



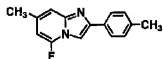
A-22



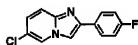
A-23



A-24



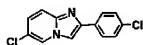
A-25



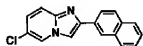
[0028]

[Formula 13]

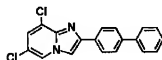
A-26



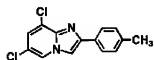
A-27



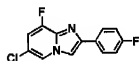
A-28



A-29



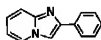
A-30



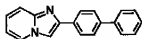
[0029]

[Formula 14]

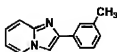
A-31



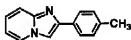
A-32



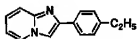
A-33



A-34



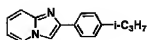
A-35



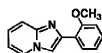
[0030]

[Formula 15]

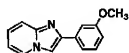
A-36



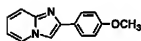
A-37



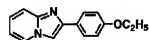
A-38



A-39



A-40

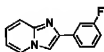


[0031]

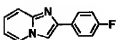
[Formula 16]



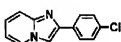
A-41



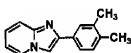
A-42



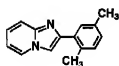
A-43



A-44



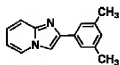
A-45



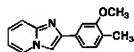
[0032]

[Formula 17]

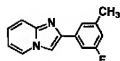
A-46



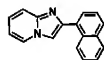
A-47



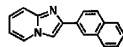
A-48



A-49



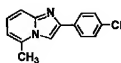
A-50



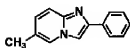
[0033]

[Formula 18]

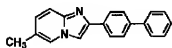
A-51



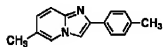
A-52



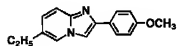
A-53



A-54



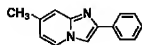
A-55



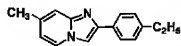
[0034]

[Formula 19]

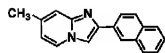
A-56



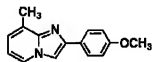
A-57



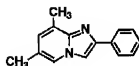
A-58



A-59



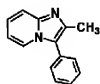
A-60



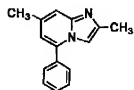
[0035]

[Formula 20]

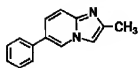
A-61



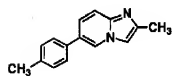
A-62



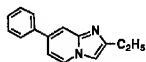
A-63



A-64



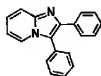
A-65



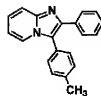
[0036]

[Formula 21]

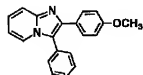
A-66



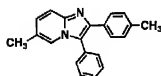
A-67



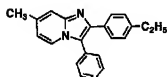
A-68



A-69



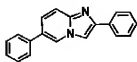
A-70



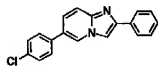
[0037]

[Formula 22]

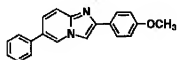
A-71



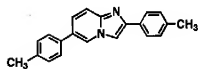
A-72



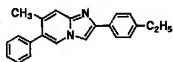
A-73



A-74



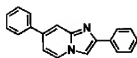
A-75



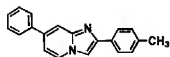
[0038]

[Formula 23]

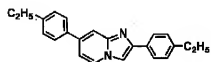
A-76



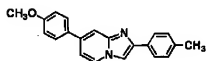
A-77



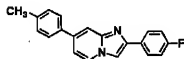
A-78



A-79



A-80

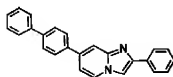


[0039]

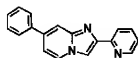
[Formula 24]



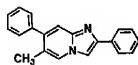
A-81



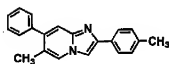
A-82



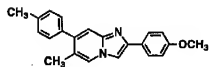
A-83



A-84



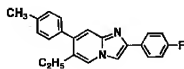
A-85



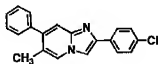
[0040]

[Formula 25]

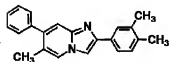
A-86



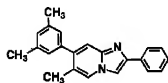
A-87



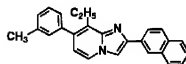
A-88



A-89



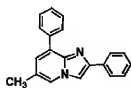
A-90



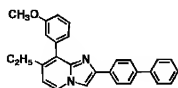
[0041]

[Formula 26]

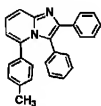
A-91



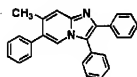
A-92



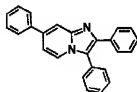
A-93



A-94



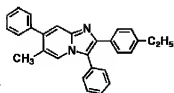
A-95



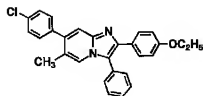
[0042]

[Formula 27]

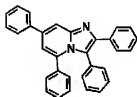
A-96



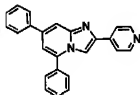
A-97



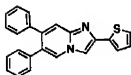
A-98



A-99



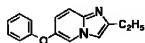
A-100



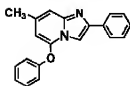
[0043]

[Formula 28]

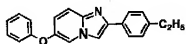
A-101



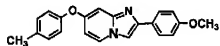
A-102



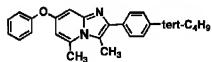
A-103



A-104

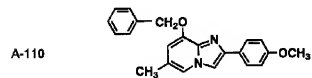
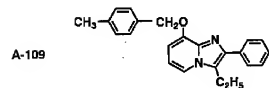
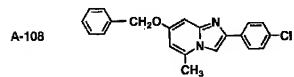
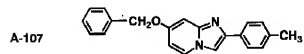
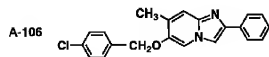


A-105



[0044]

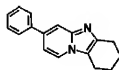
[Formula 29]



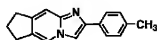
[0045]

[Formula 30]

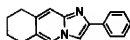
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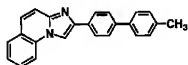
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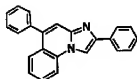
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A-114



A-115



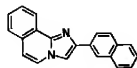
[0046]

[Formula 31]

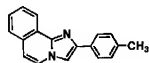
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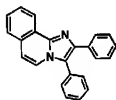
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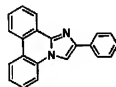
A-118



A-119



A-120



[0047]

[Formula 32]



## 例示化合物番号

B-1



B-2



B-3



B-4



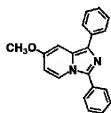
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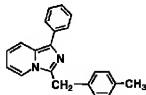
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[Formula 33]

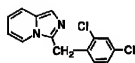
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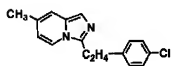
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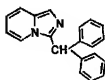
B-8



B-9



B-10



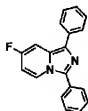
[0049]

[Formula 34]

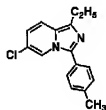
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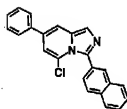
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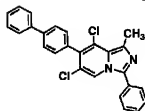
B-13



B-14



B-15



[0050]

[Formula 35]

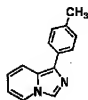
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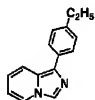
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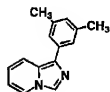
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B-19



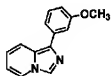
B-20



[0051]

[Formula 36]

B-21



B-22



B-23



B-24



B-25



[0052]

[Formula 37]

B-26



B-27



B-28



B-29



B-30



[0053]

[Formula 38]

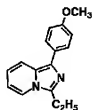
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B-32



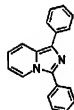
B-33



B-34



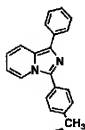
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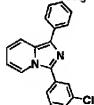
[0054]

[Formula 39]

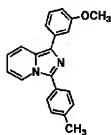
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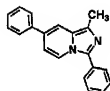
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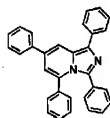
B-38



B-39



B-40

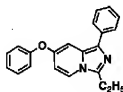


[0055]

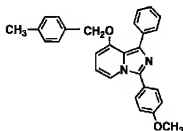
[Formula 40]



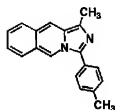
B-41



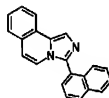
B-42



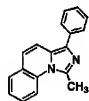
B-43



B-44



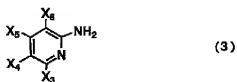
B-45



[0056]In accordance with a publicly known method, the compound A concerning this invention, for example, the compound expressed with a general formula (1-A), can be manufactured itself. For example, in accordance with the method of a statement, it can manufacture to J. Chem. Soc., 2195 (1963), J. Heterocyclic Chem., and 2 and 53 (1965). That is, after, making the compound expressed with a general formula (3) and the (\*\* 41), and the compound expressed with a general formula (4) and the (\*\* 41) react for example, it can manufacture by processing by a base (for example, sodium bicarbonate).

[0057]

[Formula 41]

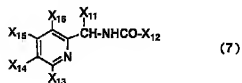
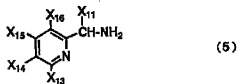


[Z expresses a halogen atom among an upper type, and  $X_1 - X_6$  express the same meaning as a case of a general formula (1-A).]

[0058] In accordance with a publicly known method, compound A concerning this invention, for example, a compound expressed with a general formula (2-A), can be manufactured itself. For example, in accordance with a method of a statement, it can manufacture to J. Chem. Soc., 2834 (1955), J. Chem. Soc. Perkin Trans. I, and 2595 (1973). That is, it can manufacture by, for example, making a phosphoryl chloride react to a compound expressed with a general formula (7) manufactured from a compound expressed with a general formula (5) and the (\*\* 42), and a compound expressed with a general formula (6) and the (\*\* 42), for example, and the (\*\* 42).

[0059]

[Formula 42]



[Z expresses a halogen atom among an upper type, and  $X_{11} - X_{16}$  express the same meaning as the case of a general formula (2-A).] Here, Z expresses a halogen atom and expresses a chlorine atom, a bromine atom, or iodine atoms preferably.

[0060] Organic electroluminescence devices usually pinch further at least a luminous layer which contains at least one sort of luminescent components in inter-electrode [ of a couple ]. In consideration of each functional level of a hole injection of a compound and electron hole transportation, electron injection, and electron transportation used for a luminous layer, an

electron injection transporting bed containing a hole-injection transporting bed and/or an electron injection transportation ingredient containing a hole-injection transportation ingredient can also be provided according to a request. For example, when a hole-injection function of a compound used for a luminous layer, an electron hole transportation function and/or an electron injection function, and an electron transportation function are good, a luminous layer can have composition of an element of a mold which served both as a hole-injection transporting bed and/or an electron injection transporting bed. Of course, it can also have composition of an element (much more element of a mold) of a mold which does not provide a layer of both a hole-injection transporting bed and an electron injection transporting bed depending on the case. Each layer of a hole-injection transporting bed, an electron injection transporting bed, and a luminous layer may be structure much more, or may be multilayer structure, and in each layer, a hole-injection transporting bed and the electron injection transporting bed can provide independently a layer which has a pouring function, and a layer which has a transportation function, and can also constitute it.

[0061] In organic electroluminescence devices of this invention, as for compound A concerning this invention, it is preferred to use for a hole-injection transportation ingredient, luminescent components, or an electron injection transportation ingredient, and it is more preferred to use for a hole-injection transportation ingredient or luminescent components. In organic electroluminescence devices of this invention, compound A concerning this invention may be used alone, or may be used together. [ two or more ]

[0062] Especially as composition of organic electroluminescence devices of this invention, it is not what is limited, For example, (A) anode / hole-injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element (drawing 1), (B) The anode / hole-injection transporting bed / luminous layer / negative pole type element (drawing 2), (C) anode / luminous layer / electron injection transporting bed / negative pole type element (drawing 3), (D) anode / luminous layer / negative pole type element (drawing 4), etc. can be mentioned. A luminous layer can also be used as (E) anode / hole-injection transporting bed / electron injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element (drawing 5) which is an element of a mold put by an electron injection transporting bed. (D) Although an element of a mold which made inter-electrode [ of a couple ] pinch luminescent components with a gestalt further is natural as element composition of a mold, An element of a mold which it made inter-electrode [ of a couple ] pinch with the one-layer gestalt which mixed (F) hole-injection transportation ingredient, luminescent components, and an electron injection transportation ingredient for example (drawing 6), (G) There is an element (drawing 8) of a mold which it made inter-electrode [ of a couple ] pinch with the one-layer gestalt which mixed an element (drawing 7), (H) luminescent components, and an electron injection transportation ingredient of a mold which it made inter-electrode [ of a

couple ] pinch with the one-layer gestalt which mixed a hole-injection transportation ingredient and luminescent components.

[0063]In organic electroluminescence devices of this invention, it cannot restrict to such element composition and a hole-injection transporting bed, a luminous layer, and a two or more layers electron injection transporting bed can be provided in each type of element. In each type of element, a mixed layer of luminescent components and an electron injection transportation ingredient can also be provided between a hole-injection transporting bed and a luminous layer between a mixed layer of a hole-injection transportation ingredient and luminescent components and/or a luminous layer, and an electron injection transporting bed. Composition of more desirable organic electroluminescence devices is (A) mold element, (B) mold element, (C) mold element, (E) mold element, (F) mold element, (G) mold element, or (H) mold element, and is (A) mold element, (B) mold element, (C) mold element, (F) mold element, or (G) mold element still more preferably.

[0064]As organic electroluminescence devices of this invention, (A) anode / hole-injection transporting bed / luminous layer / electron injection transporting bed / negative pole type element shown in (drawing 1) are explained, for example. in (drawing 1) -- 1 -- a substrate and 2 -- a luminous layer and 5 show an electron injection transporting bed, 6 shows the negative pole, and, as for a hole-injection transporting bed and 4, the anode and 3 show a power supply 7.

[0065]As for organic electroluminescence devices of this invention, being supported by the substrate 1 is preferred, and as a substrate, Although it does not limit in particular, a transparent translucent thing which is and carries out is preferred, for example, a glass plate and a transparent plastic sheet (for example, polyester.) What consists of a composite sheet which combined sheets, such as polycarbonate, polysulfone, polymethylmethacrylate, polypropylene, and polyethylene, a translucent plastic sheet, quartz, transparent ceramics, or these can be mentioned. The luminescent color is also controllable to a substrate combining a color filter film, color conversion membrane, and a dielectric reflecting film, for example.

[0066]It is preferred to use metal with a comparatively large work function, an alloy, or an electric conductivity compound as electrode material as the anode 2. As electrode material used for the anode, gold, platinum, silver, copper, cobalt, nickel, palladium, vanadium, tungsten, tin oxide, a zinc oxide, ITO (indium Tin oxide), a polythiophene, polypyrrole, etc. can be mentioned, for example. Such electrode material may be used alone or may be used together. [ two or more ] The anode can form such electrode material on a substrate by methods, such as vacuum deposition and sputtering process, for example. The anode may be structure much more or may be multilayer structure. Below hundreds of ohms / \*\* set sheet electrical resistance of the anode as 5-50ohms / \*\* grade more preferably. Although thickness of the anode is based also on material of electrode material to be used, generally it is more

preferably set as about 10-500 nm about 5-1000 nm.

[0067]The hole-injection transporting bed 3 is a layer containing a compound which has the function to convey an electron hole which makes easy pouring of an electron hole (hole) from the anode, and which was functioned and poured in. A compound which has compound A and/or other hole-injection transportation functions which a hole-injection transporting bed requires for this invention. for example, a phthalocyanine derivative and doria -- a reel methane derivative and doria -- a reel amine derivative. It can form using an oxazole derivative, a hydrazone derivative, a stilbene derivative, a pyrazoline derivative, a polysilane derivative, polyphenylene vinylene and its derivative, a polythiophene and its derivative, a poly-N-vinylcarbazole derivative, etc. at least one sort. A compound which has a hole-injection transportation function may be used alone, or may be used together. [ two or more ]

[0068]as the compound which has other hole-injection transportation functions to use in this invention -- doria -- a reel amine derivative (for example, 4,4'-screw [N-phenyl-N-(4"-methylphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(3"-methoxyphenyl) amino] Biphenyl, a 4,4'-screw [N-phenyl-N-(1"-naphthyl) amino] Biphenyl, a 3,3'-dimethyl- 4,4'-screw [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl, an 1,1-screw [4'-[N,N-JI (4"-methylphenyl) amino] phenyl] Cyclohexane, a 9,10-screw [N-(4"-methylphenyl)-N-(4"-n-butylphenyl) amino] Phenanthrene, 3,8-bis(N,N-diphenylamino)-6-phenyl phenanthridine, a 4-methyl-N,N-screw [4",4"" - bis[N',N'-JI (4-methylphenyl) amino] biphenyl 4-yl] Aniline, a N,N'-screw [4-(diphenylamino) phenyl] -N,N'-diphenyl-1,3-diaminobenzene, a N,N'-screw [4-(diphenylamino) phenyl] -N,N'-diphenyl-1,4-diaminobenzene, a 5,5"-screw [4-(bis[4-methylphenyl] amino) phenyl] -2,2':5',2"-TACHIOFEN, 1,3,5-tris(diphenylamino) benzene, a 4,4',4"-tris(N-carba ZORIRU) triphenylamine, 4 and 4, 4"-tris [An N-(3"" - methylphenyl)-N-phenylaminotriphenylamine, 4 and 4, 4"-tris [N,N-bis(4"" - tert-butylbiphenyl 4""-yl)amino] A triphenylamine, 1 and 3, 5-tris [N-(4"-diphenyl aminophenyl)-N-phenylamino] Benzene of a polythiophene and its derivative, and a poly-N-vinylcarbazole derivative, etc. are more preferred. When using together compound A concerning this invention, and a compound which has other hole-injection transportation functions, a rate of compound A concerning this invention occupied in a hole-injection transporting bed, Preferably, it prepares to about 5 to 95% of the weight especially about 1 to 99% of the weight still more preferably about 0.1 to 99.9% of the weight 0.1% of the weight or more.

[0069]The luminous layer 4 is a layer containing a compound which has an electron hole and electronic pouring functions, those transportation functions, and the function to make recombination of an electron hole and an electron generate an exciton. A compound which has compound A and/or other luminescence functions which a luminous layer requires for this invention (for example, an acridone derivative, a quinacridone derivative, a diketo pyrrole pyrrole derivative, a polynuclear aromatic compound) [For example, rubrene, anthracene,

tetracene, pyrene, perylene, A chrysene, decacycene, coronene, a tetraphenylcyclopentadiene, A pentaphenylcyclopentadiene, 9,10-diphenylanthracene, 9,10-bis(phenylethynyl)anthracene, 1,4-bis(9'-ethynylanthracenyl)benzene, 4,4'-bis(9'-ethynylanthracenyl)biphenyl] doria -- a reel amine derivative [For example, a compound mentioned above as a compound which has a hole-injection transportation function can be mentioned.] Organometallic complex[For example, tris(8-quinolate) aluminum, bis(10-benzo[h]quinolate)beryllium, Zinc salt of 2-(2'-hydroxyphenyl) benzooxazol, zinc salt of 2-(2'-hydroxyphenyl) benzothiazole, Zinc salt of 4-hydroxyacridine, zinc salt of 3-hydroxyflavone, a beryllium salt of 5-hydroxyflavone, an aluminum salt of 5-hydroxyflavone] Stilbene derivative [For example, 1,1,4,4-tetraphenyl-1,3-butadiene, 4,4'-bis(2,2-diphenylvinyl)biphenyl, 4,4'-bis[(1,1,2-triphenyl) ethenyl] biphenyl] Coumarin derivative[for example, The coumarin 1, the coumarin 6, the coumarin 7, the coumarin 30, the coumarin 106, the coumarin 138, the coumarin 151, the coumarin 152, the coumarin 153, the coumarin 307, the coumarin 311, the coumarin 314, the coumarin 334, the coumarin 338, the coumarin 343, the coumarin 500] Pyran derivativeFor example, [DCM1, DCM2] Oxazone derivative[For example, Nile red] A benzothiazole derivative, a benzo oxazole derivative, a benzimidazole derivative, A pyrazine derivative, a cinnamate derivative, poly-N-vinylcarbazole, and its derivative, A polythiophene and its derivative, polyphenylene, and its derivative, Polyful Oren and its derivative, polyphenylene vinylene, and its derivative, It can form using poly biphenylene vinylene and its derivative, poly terphenylene vinylene and its derivative, poly naphthylene vinylene and its derivative, poly thienylene vinylene, its derivative, etc. at least one sort. In organic electroluminescence devices of this invention, it is preferred to contain compound A which starts this invention at a luminous layer. When using together compound A concerning this invention, and a compound which has other luminescence functions, a rate of compound A concerning this invention occupied in a luminous layer, It prepares to about 0.1 to 99.9% of the weight still more preferably about 0.01 to 99.99% of the weight more preferably about 0.001 to 99.999% of the weight.

[0070]as the compound which has other luminescence functions used in this invention -- a polynuclear aromatic compound, a luminescent organometallic complex, and doria -- a reel amine derivative is more preferred. For example, a luminous layer can also consist of a host compound and a guest compound (dopant) like a statement in J. Appl. Phys., 65 and 3610 (1989), and JP,5-214332,A. A luminous layer can be formed using compound A concerning this invention as a host compound, further, it can use as a guest compound and a luminous layer can also be formed. When forming a luminous layer, using compound A concerning this invention as a host compound, as a guest compound, a compound which has other aforementioned luminescence functions can be mentioned, for example, and a polynuclear aromatic compound is preferred especially. In this case, to compound A concerning this

invention, a compound which has other luminescence functions is twisted and is used especially about 0.1 to 20% of the weight about 0.01 to 30% of the weight about 0.001 to 40% of the weight preferably.

[0071]As a polynuclear aromatic compound used together with compound A concerning this invention, Although it does not limit in particular, for example Rubrene, anthracene, tetracene, Pyrene, perylene, a chrysene, decacycene, coronene, a tetraphenylcyclopentadiene, A pentaphenylcyclopentadiene, 9,10-diphenylanthracene, 9,10-bis(phenylethynyl)anthracene, 1,4-bis(9'-ethynylanthracenyl)benzene, 4,4'-bis(9'-ethynylanthracenyl)biphenyl, etc. can be mentioned. Of course, a polynuclear aromatic compound may be used alone or may be used together. [ two or more ]

[0072]when forming a luminous layer, using compound A concerning this invention as a guest compound, as a host compound, a compound which has other aforementioned luminescence functions can be mentioned, for example -- for example, a luminescent organometallic complex or doria -- a reel amine derivative is more preferred. in this case, a luminescent organometallic complex or doria -- compound A which starts this invention to a reel amine derivative -- desirable -- about 0.001 to 40 % of the weight -- it is used especially about 0.1 to 20% of the weight preferably about 0.01 to 30% of the weight.

[0073]Especially as a luminescent organometallic complex used together with compound A concerning this invention, although it does not limit, a luminescent organic aluminium complex is preferred and a luminescent organic aluminium complex which has 8-quinolate ligand which is not replaced [ substitution or ] is more preferred. As a luminescent desirable organometallic complex, a luminescent organic aluminium complex expressed with a general formula (a) - a general formula (c) can be mentioned, for example.

(Q)<sub>3</sub>-aluminum (a)

(Q expresses among a formula 8-quinolate ligand which is not replaced [ substitution or ])

(Q)<sub>2</sub>-aluminum-O-L (b)

(Q expresses a substitution 8-quinolate ligand among a formula, O-L is a phenolate ligand and L expresses a hydrocarbon group of the carbon numbers 6-24 containing phenyl moiety)

(Q)<sub>2</sub>-aluminum-O-aluminum-(Q)<sub>2</sub> (c)

(Q expresses a substitution 8-quinolate ligand among a formula)

[0074]As an example of a luminescent organometallic complex, for example Tris(8-quinolate) aluminum, Tris(4-methyl-8-quinolate) aluminum, tris(5-methyl-8-quinolate) aluminum, Tris(3,4-dimethyl- 8-quinolate) aluminum, tris(4,5-dimethyl- 8-quinolate) aluminum, Tris(4,6-dimethyl- 8-quinolate) aluminum, bis(2-methyl-8-quinolate)(phenolate) aluminum, Bis(2-methyl-8-quinolate)(2-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)(4-methylphenolate) aluminum, Bis(2-methyl-8-quinolate)

(2-phenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3-phenylphenolate) aluminum, bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum, bis(2-methyl-8-quinolate)(2,3-dimethylphenolate) aluminum. Bis(2-methyl-8-quinolate)(2,6-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,4-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,5-dimethylphenolate) aluminum, Bis(2-methyl-8-quinolate)(3,5-di-tert-butylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,6-diphenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,6-triphenylphenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,6-trimethyl phenolate) aluminum, Bis(2-methyl-8-quinolate)(2,4,5,6-tetramethyl phenolate) aluminum, Bis(2-methyl-8-quinolate)(1-naphtho RATO) aluminum, bis(2-methyl-8-quinolate)(2-naphtho RATO) aluminum, bis(2,4-dimethyl- 8-quinolate)(2-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(3-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(4-phenylphenolate) aluminum, Bis(2,4-dimethyl- 8-quinolate)(3,5-dimethylphenolate) aluminum, bis(2,4-dimethyl- 8-quinolate)(3,5-di-tert-butylphenolate) aluminum, [0075]Bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum, Bis(2,4-dimethyl- 8-quinolate)aluminum mu-oxo bis(2,4-dimethyl- 8-quinolate)aluminum, Bis(2-methyl-4-ethyl-8-quinolate)aluminum mu-oxo bis(2-methyl-4-ethyl-8-quinolate)aluminum, Bis(2-methyl-4-methoxy-8-quinolate)aluminum mu-oxo bis(2-methyl-4-methoxy-8-quinolate)aluminum, Bis(2-methyl-5-cyano 8-quinolate)aluminum mu-oxo bis(2-methyl-5-cyano 8-quinolate)aluminum, Bis(2-methyl-5-trifluoromethyl 8-quinolate)aluminum mu-oxo bis(2-methyl-5-trifluoromethyl 8-quinolate)aluminum etc. can be mentioned. Of course, a luminescent organometallic complex may be used alone or may be used together. [ two or more ]

[0076]The electron injection transporting bed 5 is a layer containing a compound which has the function to convey an electron which makes pouring of an electron from the negative pole easy, and which was functioned and poured in. A compound which has compound A and/or other electron injection transportation functions which an electron injection transporting bed requires for this invention (for example, organometallic complex) [For example, tris(8-quinolate) aluminum, bis(10-benzo[h] quinolate)beryllium, a beryllium salt of 5-hydroxyflavone, an aluminum salt of 5-hydroxyflavone] Oxadiazole derivative [For example, 1,3-bis[5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] benzene] Triazole derivative[For example, 3-(4'-tert-buthylphenyl)-4-phenyl-5-(4"-biphenyl)-1,2,4-triazole] It can form using a triazine derivative, a perylene derivative, a quinoline derivative, a quinoxaline derivative, a diphenyl quinone derivative, a nitration fluorenone derivative, a thiopyran dioxide derivative, etc. at least one sort. When using together compound A concerning this invention, and a compound which has other electron injection transportation functions, a rate of compound A concerning this invention occupied in an electron injection transporting bed is preferably prepared to about 0.1 to 40% of the weight. Compound A and an organometallic complex which start this invention in this invention It is preferred to use together [for example, a compound expressed with said



general formula (a) - a general formula (c)], and to form an electron injection transporting bed. [0077]It is preferred to use metal with a comparatively small work function, an alloy, or an electric conductivity compound as electrode material as the negative pole 6. As electrode material used for the negative pole, for example Lithium, a lithium indium alloy, Sodium, a sodium potassium alloy, calcium, magnesium, A magnesium silver alloy, a magnesium indium alloy, indium, A ruthenium, titanium, manganese, yttrium, aluminum, an aluminium-lithium alloy, an aluminum calcium alloy, an aluminum magnesium alloy, a graphite thin film, etc. can be mentioned. Such electrode material may be used alone or may be used together. [ two or more ] The negative pole can form such electrode material on an electron injection transporting bed by methods, such as vacuum deposition, sputtering process, ionization vacuum deposition, the ion plating method, and the ionized cluster beam method, for example. The negative pole may be structure much more, or may be multilayer structure. As for sheet electrical resistance of the negative pole, it is preferred to set to below hundreds of ohms / \*\*. Although thickness of the negative pole is based also on material of electrode material to be used, generally it is more preferably set as about 10-500 nm about 5-1000 nm. In order to take out luminescence of organic electroluminescence devices efficiently, a translucent thing with at least one transparent electrode of the anode or the negative pole which is and carries out is preferred, and it is more preferred to set up material of the anode and thickness generally, so that transmissivity of luminescent light may be not less than 70%.

[0078]moreover -- in organic electroluminescence devices of this invention -- the -- a singlet oxygen quencher may contain in inside further at least. Especially as a singlet oxygen quencher, it does not limit, rubrene, a nickel complex, diphenylisobenzofuran, etc. are mentioned, for example, and it is rubrene especially preferably. Especially as a layer which a singlet oxygen quencher contains, although it does not limit, it is a luminous layer or a hole-injection transporting bed, and is a hole-injection transporting bed more preferably. For example, when making a hole-injection transporting bed contain a singlet oxygen quencher, it may be made to contain uniformly in a hole-injection transporting bed, and may be made to contain near the layer (for example, a luminous layer, an electron injection transporting bed which has a luminescence function) which adjoins a hole-injection transporting bed. 0.01- of entire volume which constitutes a layer (for example, hole-injection transporting bed) to contain as content of a singlet oxygen quencher -- it is 0.1 to 20 % of the weight more preferably 0.05 to 30% of the weight 50% of the weight.

[0079]About a formation method of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, Not a thing limited especially but a vacuum deposition method, ionization vacuum deposition, It is producible by forming a thin film by the solution applying methods (for example, a spin coat method, the cast method, a dip coating method, the bar coat method, the roll coat method, a Langmuir-Blodgett method, the ink jet method,

etc.). When forming each class with a vacuum deposition method, conditions of vacuum deposition, Although it does not limit in particular, it is preferred under a vacuum below a  $10^{-5}$  Torr grade to carry out with an evaporation rate of about 0.005-50nm/sec with boat temperature (deposition source temperature) of about 50-600 °C and about [-50-300 °C] substrate temperature. In this case, each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, can manufacture organic electroluminescence devices which were further excellent in various characteristics by forming continuously under a vacuum. When forming each class, such as a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, with a vacuum deposition method using two or more compounds, it is preferred to carry out temperature control of each boat into which a compound was put individually, and to carry out vapor codeposition.

[0080]By the solution applying method, when you form each class, a solvent is dissolved or distributed and let an ingredient which forms each class, its ingredient, binder resin, etc. be coating liquid. As binder resin which can be used for each class of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, For example, poly-N-vinylcarbazole, polyarylate, polystyrene, Polyester, a polysiloxane, polymethyl acrylate, polymethylmethacrylate, Polyether, polycarbonate, polyamide, polyimide, polyamidoimide, Poly paraxylene, polyethylene, polyethylene ether, polypropylene ether, Polyphenylene oxide, polyether sulphone, poly aniline, and its derivative, High molecular compounds, such as a polythiophene and its derivative, polyphenylene vinylene and its derivative, Polyful Oren and its derivative, poly thienylene vinylene, and its derivative, are mentioned. Binder resin may be used alone or may be used together. [ two or more ]

[0081]When forming each class by the solution applying method, an ingredient which forms each class, its ingredient, binder resin, etc., a suitable organic solvent (for example, hexane, octane, Deccan, and toluene.) Hydrocarbon system solvents, such as xylene, ethylbenzene, and 1-methylnaphthalene, For example, acetone, methyl ethyl ketone, methyl isobutyl ketone, Ketone solvent, for example, dichloromethane, such as cyclohexanone, chloroform, Tetrachloromethane, a dichloroethane, trichloroethane, tetrachloroethane, Halogenated hydrocarbon system solvents, such as chlorobenzene, dichlorobenzene, and chlorotoluene, For example, ester solvent, such as ethyl acetate, butyl acetate, and amyl acetate, For example, methanol, ethanol, propanol, butanol, a pentanol, A hexanol, cyclohexanol, methyl cellosolve, ethylcellosolve, Alcoholic solvent, for example, dibutyl ether, such as ethylene glycol, Ether system solvents, for example, N,N-dimethylformamide, such as a tetrahydrofuran, dioxane, and an anisole, N,N-dimethylacetamide, a 1-methyl-2-pyrrolidone, 1,3-dimethyl-2-imidazolidinone, A polar solvent and/or water, such as dimethyl sulfoxide, can be dissolved or distributed, it can be considered as coating liquid, and a thin film can be formed by various kinds of applying methods.

[0082]Although it does not limit especially as a method of distributing, it can distribute in the shape of a particle using a ball mill, a sand mill, a paint shaker, attritor, a homogenizer, etc., for example. It cannot limit, can be set as a density range which was suitable for producing desired thickness by the applying method to enforce, especially concerning concentration of coating liquid, and, generally is about 1 to 30% of the weight of solution concentration preferably about 0.1 to 50% of the weight. Concerning the amount used, when using binder resin, Although it does not limit in particular, generally it sets up to about 15 to 90% of the weight more preferably about 10 to 99% of the weight about 5 to 99.9% of the weight to an ingredient which forms each class (receiving a total amount of each ingredient, in forming an element of a mold further).

[0083]Although it does not limit especially concerning thickness of a hole-injection transporting bed, a luminous layer, and an electron injection transporting bed, generally it is preferred to set it as 5 nm - about 5 micrometers. For the purpose of preventing contact with oxygen, moisture, etc. to a produced element. A protective layer (sealing layer) can be provided, and an element can be enclosed in inactive substances, such as paraffin, a liquid paraffin, a silicone oil, a fluorocarbon oil, and a zeolite content fluorocarbon oil, for example, and can be protected. As a material used for a protective layer, for example A charge of an organic high polymer material. for example, fluorination resin, an epoxy resin, silicone resin, and epoxy silicone resin. Polystyrene, polyester, polycarbonate, polyamide, polyimide, Polyamidoimide, poly paraxylene, polyethylene, polyphenylene oxide, An inorganic material (for example, diamond membrane, amorphous silica, and electric insulation glass, a metallic oxide, metal nitride, a graphitized carbon ghost, metallic sulfide) and material which can mention a photo-setting resin etc. further and is used for a protective layer may be used alone, or may be used together. [ two or more ] A protective layer may be structure much more, and may be multilayer structure.

[0084]A metallic oxide film (for example, aluminum oxide film) and a metal fluoridation film can also be provided in an electrode as a protective film, for example. For example, a volume phase (interlayer) which comprises an organophosphorus compound, polysilane, an aromatic amine derivative, a phthalocyanine derivative (for example, copper phthalocyanine), and carbon can also be provided on the surface of the anode. An electrode, for example, the anode, can also process and use the surface with acid, ammonia/hydrogen peroxide, or plasma, for example.

[0085]Generally, organic electroluminescence devices of this invention can be used also as a pulse drive type or alternating current drive type element, although used as a direct-current drive type element. Generally impressed electromotive force is about 2-30V. Organic electroluminescence devices of this invention can be used for a panel type light source, various kinds of light emitting devices, various kinds of display devices, various kinds of signs,

various kinds of sensors, etc., for example.

[0086]

[Example] Hereafter, although an example explains this invention still in detail, of course, this invention is not limited to these.

The glass substrate which has an ITO transparent electrode (anode) with an example 1 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, on the ITO transparent electrode, the compound of the illustration compound number A-9 was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec on it, and it was considered as the luminous layer which served as the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, it was considered as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Direct current voltage was impressed to the produced organic electroluminescence devices, and the continuation drive was carried out by the constant current density of 10 mA/cm<sup>2</sup> under a drying atmosphere. In early stages, green luminescence of 6.5V and luminosity 510 cd/m<sup>2</sup> was checked. The half-life of luminosity was 600 hours.

[0087] Formation of a hole-injection transporting bed is faced in two to example 19 Example 1, Instead of using the compound of the illustration compound number A-9, the compound of the illustration compound number A-15 (example 2), The compound (example 3) of the illustration compound number A-27, the compound of the illustration compound number A-32 (example 4), The compound (example 5) of the illustration compound number A-39, the compound of the illustration compound number A-42 (example 6), The compound (example 7) of the illustration compound number A-50, the compound of the illustration compound number A-53 (example 8), The compound (example 9) of the illustration compound number A-66, the compound of the illustration compound number A-76 (example 10), The compound (example 11) of the illustration compound number A-84, the compound of the illustration compound number A-95 (example 12), The compound (example 13) of the illustration compound number A-104, the illustration compound number A-117 (example 14), The illustration compound number B-12 (example 15), the illustration compound number B-18 (example 16), Organic electroluminescence devices were produced by the method of the statement in the Example 1

except having used the illustration compound number B-26 (example 17), the illustration compound number B-35 (example 18), and the illustration compound number B-44 (example 19). Green luminescence was checked from each element. Furthermore the characteristic was investigated and the result was shown in the 1st table (Table 1).

[0088] It is a 4,4'-screw instead of using the compound of the illustration compound number A-9 when forming a hole-injection transporting bed in comparative example 1 Example 1. [N-phenyl-N-(3"-methylphenyl) amino] Except having used biphenyl, organic electroluminescence devices were produced by the method of the statement in the Example 1. Green luminescence was checked from the element. Furthermore the characteristic was investigated and the result was shown in the 1st table (Table 1).

[0089]

[Table 1]

第 1 表

有機電界 発光素子	初期特性		半減期 (h r)
	輝度 ( $\text{cd}/\text{m}^2$ )	電圧 (V)	
実施例 2	480	6.6	580
実施例 3	470	6.5	600
実施例 4	450	6.5	580
実施例 5	470	6.5	610
実施例 6	500	6.6	590
実施例 7	460	6.3	620
実施例 8	480	6.4	590
実施例 9	460	6.7	600
実施例 10	460	6.5	610
実施例 11	470	6.6	580
実施例 12	490	6.6	620
実施例 13	500	6.7	590
実施例 14	480	6.6	610
実施例 15	470	6.4	590
実施例 16	500	6.5	570
実施例 17	460	6.5	620
実施例 18	490	6.6	600
実施例 19	480	6.5	590
比較例 1	300	5.2	120

[0090]The glass substrate which has an ITO transparent electrode (anode) with an example 20 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, on the ITO transparent electrode, with the evaporation rate of 0.1nm/sec, poly (thiophene 2,5-diyl) was vapor-deposited in thickness of 20 nm, and was made into the first hole-injection transporting bed. Subsequently, the compound of the illustration compound number A-20 was vapor-deposited in thickness of 55 nm with the evaporation rate of 0.2nm/sec, and was made into the second hole-injection transporting bed. Subsequently, tris(8-kino RINORA note) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec on it, and it was considered as the luminous layer which served as the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Direct current voltage was impressed to the produced organic electroluminescence devices, and the continuation drive was carried out by the constant current density of 10 mA/cm<sup>2</sup> under a drying atmosphere. In early stages, green luminescence of 6.4V and luminosity 510 cd/m<sup>2</sup> was checked. The half-life of luminosity was 1240 hours.

[0091]The glass substrate which has an ITO transparent electrode (anode) with an example 21 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, on the ITO transparent electrode, with the evaporation rate of 0.1nm/sec, the compound of the illustration compound number A-44 was vapor-deposited in thickness of 20 nm, and was made into the first hole-injection transporting bed. Subsequently, vapor codeposition (weight ratio 10:1) of the compound and rubrene of the illustration compound number A-58 was carried out to a thickness of 55 nm with the evaporation rate of 0.2nm/sec from a different evaporation source, and it was considered as the luminous layer which served as the second hole-injection transporting bed. Moreover, tris (8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was

carried out with the reduced pressure state of a vacuum evaporation tub maintained. Direct current voltage was impressed to the produced organic electroluminescence devices, and the continuation drive was carried out by the constant current density of  $10 \text{ mA/cm}^2$  under a drying atmosphere. In early stages, luminescence of the yellow of 6.1V and luminosity  $530 \text{ cd/m}^2$  was checked. The half-life of luminosity was 1500 hours.

[0092]The glass substrate which has an ITO transparent electrode (anode) with an example 22 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, on the ITO transparent electrode, the compound of the illustration compound number A-70 was vapor-deposited in thickness of 55 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, vapor codeposition (weight ratio 10:1) of the compound of bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum and the illustration compound number A-119 was carried out to a thickness of 40 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Tris(8-quinolate) aluminum was vapor-deposited in thickness of 30 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Direct current voltage was impressed to the produced organic electroluminescence devices, and the continuation drive was carried out by the constant current density of  $10 \text{ mA/cm}^2$  under a drying atmosphere. In early stages, luminescence of the blue-green of 6.2V and luminosity  $550 \text{ cd/m}^2$  was checked. The half-life of luminosity was 1400 hours.

[0093]The glass substrate which has an ITO transparent electrode (anode) with an example 23 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, the compound of polycarbonate (weight average molecular weight 50000) and the illustration compound number A-6 was made into a 40-nm hole-injection transporting bed with the dip coating method on the ITO transparent electrode using the 3-% of the weight dichloroethane solution contained at a rate of the weight ratio 100:50. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this hole-injection transporting bed, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. Subsequently, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec

on it, and it was considered as the luminous layer which served as the electron injection transporting bed. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 10V was impressed to the produced organic electroluminescence devices, the current of  $94 \text{ mA/cm}^2$  flowed into them. Green luminescence of luminosity  $970 \text{ cd/m}^2$  was checked. The half-life of luminosity was 270 hours.

[0094]The glass substrate which has an ITO transparent electrode (anode) with an example 24 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. On an ITO transparent electrode, next, polymethylmethacrylate (weight average molecular weight 25000), A 100-nm luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution which contains the compound of the illustration compound number B-28, and tris(8-quinolate) aluminum at a rate of the weight ratio 100:50:0.5, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $78 \text{ mA/cm}^2$  flowed into them. Green luminescence of luminosity  $550 \text{ cd/m}^2$  was checked. The half-life of luminosity was 330 hours.

[0095]The glass substrate which has an ITO transparent electrode (anode) with an example 25 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:0.5) of the compound of bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum and the illustration compound number A-98 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor



codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of  $55 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $2320 \text{ cd/m}^2$  was checked.

[0096]In 26 to example 37 Example 25, instead of using the compound of the illustration compound number A-98 when forming a luminous layer, The compound (example 26) of the illustration compound number A-1, the compound of the illustration compound number A-17 (example 27), The compound (example 28) of the illustration compound number A-19, the compound of the illustration compound number A-34 (example 29), The compound (example 30) of the illustration compound number A-47, the compound of the illustration compound number A-56 (example 31), The compound (example 32) of the illustration compound number A-68, the compound of the illustration compound number A-73 (example 33), The compound (example 34) of the illustration compound number A-110, the compound of the illustration compound number B-2 (example 35), Organic electroluminescence devices were produced by the method of the statement in the Example 25 except having used the compound (example 36) of the illustration compound number B-22, and the compound (example 37) of the illustration compound number B-34. When the direct current voltage of 12V was impressed to each element under a drying atmosphere, luminescence of blue - blue-green was checked. Furthermore the characteristic was investigated and the result was shown in the 2nd table (Table 2).

[0097]In comparative example 2 Example 25, when forming a luminous layer, without using the compound of the illustration compound number A-98, Only using bis(2-methyl-8-quinolate)(4-phenylphenolate) aluminum, it vapor-deposited in thickness of 50 nm, and organic electroluminescence devices were produced by the method of the statement in the Example 25 except having considered it as the luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 2nd table.

[0098]In comparative example 3 Example 25, organic electroluminescence devices were produced by the method of the statement in the Example 25 except having used N-methyl-2-methoxy acridone instead of using the compound of the illustration compound number A-98 when forming a luminous layer. Blue luminescence was checked when the direct current voltage of 12V was impressed to this element under a drying atmosphere. Furthermore the characteristic was investigated and the result was shown in the 2nd table.

[0099]

[Table 2]  
第 2 表

有機電界 発光素子	輝度 ( $\text{cd}/\text{m}^2$ )	電流密度 ( $\text{mA}/\text{cm}^2$ )
実施例 2 6	2 2 8 0	5 7
実施例 2 7	2 2 5 0	5 5
実施例 2 8	2 2 2 0	5 4
実施例 2 9	2 2 5 0	5 5
実施例 3 0	2 2 8 0	5 6
実施例 3 1	2 2 6 0	5 7
実施例 3 2	2 2 7 0	5 8
実施例 3 3	2 2 8 0	5 6
実施例 3 4	2 3 0 0	5 4
実施例 3 5	2 2 9 0	5 5
実施例 3 6	2 2 8 0	5 6
実施例 3 7	2 3 2 0	5 8
比較例 2	1 1 7 0	8 2
比較例 3	1 5 5 0	7 4

[0100]The glass substrate which has an ITO transparent electrode (anode) with an example 38 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, from a different deposition source, vapor codeposition (weight ratio 100:1.0) of the compound of bis(2-methyl-8-quinolate)(2-phenylphenolate) aluminum and the illustration compound number A-28 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was made into the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying

atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of  $57 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $2310 \text{ cd/m}^2$  was checked.

[0101]The glass substrate which has an ITO transparent electrode (anode) with an example 39 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, it is a 4,4'-screw to an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it the compound of bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum and the illustration compound number A-77, From a different deposition source, vapor codeposition (weight ratio 100:2.0) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of  $56 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $2280 \text{ cd/m}^2$  was checked.

[0102]The glass substrate which has an ITO transparent electrode (anode) with an example 40 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it the compound of bis(2,4-dimethyl- 8-quinolate)aluminum mu-oxo bis(2,4-dimethyl- 8-quinolate)aluminum and the illustration compound number A-96, From a different deposition source, vapor codeposition (weight ratio 100:4.0) was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec, and it was considered as the luminous layer. Next, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed.

Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 59 mA/cm<sup>2</sup> flowed into them. Blue luminescence of luminosity 2340 cd/m<sup>2</sup> was checked.

[0103]The glass substrate which has an ITO transparent electrode (anode) with an example 41 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3x10<sup>-6</sup>Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, vapor codeposition (weight ratio 100:1.0) of the compound of tris(8-quinolate) aluminum and the illustration compound number A-49 was carried out to a thickness of 50 nm with the evaporation rate of 0.2nm/sec from a different deposition source on it, and it was considered as the luminous layer which served as the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of 58 mA/cm<sup>2</sup> flowed into them. Luminescence of the blue-green of luminosity 2210 cd/m<sup>2</sup> was checked.

[0104]The glass substrate which has an ITO transparent electrode (anode) with an example 42 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to 3x10<sup>-6</sup>Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] Biphenyl was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the hole-injection transporting bed. Subsequently, on it, the compound of the illustration compound number B-16 was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the luminous layer. Subsequently, it is a 1,3-screw on it. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] Benzene was vapor-deposited in thickness of 50 nm with the evaporation rate of

0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 14V was impressed to the produced organic electroluminescence devices, the current of  $48 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $1780 \text{ cd/m}^2$  was checked.

[0105]The glass substrate which has an ITO transparent electrode (anode) with an example 43 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, on the ITO transparent electrode, the compound of the illustration compound number A-58 was vapor-deposited in thickness of 55 nm with the evaporation rate of 0.2nm/sec, and was made into the luminous layer. Subsequently, it is a 1,3-screw on it. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] Benzene was vapor-deposited in thickness of 75 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $66 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $1270 \text{ cd/m}^2$  was checked.

[0106]The glass substrate which has an ITO transparent electrode (anode) with an example 44 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, they are 4, 4', and 4"-tris on an ITO transparent electrode. [N-(3'''-methylphenyl)-N-phenylamino] The triphenylamine was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.1nm/sec, and was made into the first hole-injection transporting bed. Subsequently, a 4,4'-screw [N-phenyl-N-(1"-naphthyl) amino] Vapor codeposition (weight ratio 100:10) of biphenyl and the compound of the illustration compound number A-66 was carried out to a thickness of 20 nm with the evaporation rate of 0.2nm/sec from a different deposition source, and it was considered as the luminous layer which served

as the second hole-injection transporting bed. Next, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $63 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $2580 \text{ cd/m}^2$  was checked.

[0107]The glass substrate which has an ITO transparent electrode (anode) with an example 45 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, they are 4, 4', and 4"-tris on an ITO transparent electrode. [N-(3"-methylphenyl)-N-phenylamino] The triphenylamine was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.1nm/sec, and was made into the first hole-injection transporting bed. Subsequently, a 4,4'-screw [N-phenyl-N-(1"-naphthyl) amino] Vapor codeposition (weight ratio 100:5) of biphenyl and the compound of the illustration compound number B-26 was carried out to a thickness of 20 nm with the evaporation rate of 0.2nm/sec from a different deposition source, and it was considered as the luminous layer which served as the second hole-injection transporting bed. Next, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $65 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $2880 \text{ cd/m}^2$  was checked.

[0108]The glass substrate which has an ITO transparent electrode (anode) with an example 46 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, it is a 4,4'-screw on an ITO transparent electrode. [N-

phenyl-N-(1"-naphthyl) amino] With the evaporation rate of 0.1nm/sec, biphenyl was vapor-deposited in thickness of 50 nm, and was made into the hole-injection transporting bed. Subsequently, from a different deposition source, with the evaporation rate of 0.2nm/sec, vapor codeposition (weight ratio 100:10) of the compound and decacyclene of the illustration compound number A-95 was carried out to a thickness of 50 nm, and they were made into the luminous layer. Subsequently, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, it was considered as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $62 \text{ mA/cm}^2$  flowed into them. Green luminescence of luminosity  $2680 \text{ cd/m}^2$  was checked.

[0109]The glass substrate which has an ITO transparent electrode (anode) with an example 47 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. After having dried the substrate using nitrogen gas, and UV / carrying out an ozone wash and fixing to the substrate holder of an evaporation apparatus further, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. First, they are 4, 4', and 4"-tris on an ITO transparent electrode. [N-(3"-methylphenyl)-N-phenylamino] With the evaporation rate of 0.1nm/sec, the triphenylamine was vapor-deposited in thickness of 50 nm, and was made into the hole-injection transporting bed. Subsequently, from a different deposition source, with the evaporation rate of 0.2nm/sec, vapor codeposition (weight ratio 100:7) of the compound and rubrene of the illustration compound number A-46 was carried out to a thickness of 50 nm, and they were made into the luminous layer. Subsequently, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 50 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, it was considered as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $66 \text{ mA/cm}^2$  flowed into them. Luminescence of the yellow of luminosity  $3100 \text{ cd/m}^2$  was checked.

[0110]The glass substrate which has an ITO transparent electrode (anode) with an example 48

thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are a compound of poly-N-vinylcarbazole (weight average molecular weight 150000) and the illustration compound number A-88, and the coumarin 6 on an ITO transparent electrode. ["3-(2'-benzothiazolyl)-7-diethylamino coumarin]" (green luminescent components) And DCM1 "[4-(dicyanomethylene)-2-methyl-6-(4'-dimethylaminostyryl)-4H-Piran]" (orange luminescent components), The 400-nm-thick luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution contained at a rate of the weight ratio 100:5:3:2, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. On a luminous layer, 3-(4'-tert-buthylphenyl)-4-phenyl 5-(4"-biphenyl)-1,2,4-triazole, After vapor-depositing in thickness of 20 nm with the evaporation rate of 0.2nm/sec, further, on it, tris(8-quinolate) aluminum was vapor-deposited in thickness of 30 nm with the evaporation rate of 0.2nm/sec, and was made into the electron injection transporting bed. Furthermore, on it, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Vacuum evaporation was carried out with the reduced pressure state of a vacuum evaporation tub maintained. Under a drying atmosphere, when the direct current voltage of 12V was impressed to the produced organic electroluminescence devices, the current of  $73 \text{ mA/cm}^2$  flowed into them. White luminescence of luminosity  $1250 \text{ cd/m}^2$  was checked.

[0111]The glass substrate which has an ITO transparent electrode (anode) with an example 49 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are poly-N-vinylcarbazole (weight average molecular weight 150000) and a 1,3-screw on an ITO transparent electrode. [5'-(p-tert-buthylphenyl)-1,3,4-oxadiazole 2'-yl] The 300-nm-thick luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution which contains the compound of benzene and the illustration compound number A-36 at a rate of the weight ratio 100:30:3, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $73 \text{ mA/cm}^2$  flowed into them. Blue luminescence



of luminosity  $1340 \text{ cd/m}^2$  was checked.

[0112]In comparative example 4 Example 49, organic electroluminescence devices were produced by the method of the statement in the Example 49 instead of the compound of the illustration compound number A-36 when forming a luminous layer except having used 1,1,4,4-tetraphenyl-1,3-butadiene. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electric field element, the current of  $86 \text{ mA/cm}^2$  flowed into it. Blue luminescence of luminosity  $680 \text{ cd/m}^2$  was checked.

[0113]The glass substrate which has an ITO transparent electrode (anode) with an example 50 thickness of 200 nm was cleaned ultrasonically using neutral detergent, acetone, and ethanol. It dried using nitrogen gas and UV/ozone wash carried out the substrate further. Next, they are polycarbonate (weight average molecular weight 50000) and a 4,4'-screw on an ITO transparent electrode. [N-phenyl-N-(3"-methylphenyl) amino] The compound of biphenyl, bis(2-methyl-8-quinolate)aluminum mu-oxo bis(2-methyl-8-quinolate)aluminum, and the illustration compound number B-30, The 300-nm-thick luminous layer was formed with the dip coating method using the 3-% of the weight dichloroethane solution contained at a rate of the weight ratio 100:40:60:1, respectively. Next, after fixing to the substrate holder of an evaporation apparatus the glass substrate which has this luminous layer, the vacuum evaporation tub was decompressed to  $3 \times 10^{-6}$  Torr. On the luminous layer, vapor codeposition (weight ratio 10:1) of magnesium and the silver was carried out to a thickness of 200 nm with the evaporation rate of 0.2nm/sec, they were used as the negative pole, and organic electroluminescence devices were produced. Under a drying atmosphere, when the direct current voltage of 15V was impressed to the produced organic electroluminescence devices, the current of  $67 \text{ mA/cm}^2$  flowed into them. Blue luminescence of luminosity  $800 \text{ cd/m}^2$  was checked.

[0114]

[Effect of the Invention]The luminescence life was long and this invention enabled it to provide organic electroluminescence devices excellent in light emitting luminance.

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[Translation done.]